STIRLING
ULTRACOLD
GLOBAL COOLING • GLOBAL CONSERVATION

Shuttle™ ULT:25 -86°C
Portable Ultra Low Temperature Freezer

Operating Manual

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SHUTTLE°C

Ultra Low. Ultra Portable.

The ULT-25 (Ultra Low Temperature, 25 liter volume) incorporates next generation Free-Piston Stirling Cooler (FPSC) technology. FPSCs differ from conventional compressor-based refrigeration in that they provide high efficiency, deep-temperature cooling in a lightweight package allowing true portable operation.

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Safety Precautions

To prevent personal injury, injury to others, or damage to property, read these safety precautions carefully before use.

- **Do not** disassemble, modify or repair. There are no user serviceable parts inside the freezer unit.
- **Do not** immerse in water or pour water on the unit.
- **Do not** put ice or liquid water directly in the freezer box, always use suitable containers.
- **Do not** use glass containers when the contents might freeze and break.
- **Do not** store flammable items such as gasoline, thinner or solvents in the freezer. The freezer is NOT rated as an explosion-proof freezer.
- **Do not** use hard and/or sharp objects, such as knives, screwdrivers, etc. to remove any frost or ice which has accumulated on the inside of the freezer. The inside panels are heat exchangers and can be damaged.
- **Do not** cut, change or modify the power cable.
- When removing the plug, hold onto the plug and not the cord.
- **Do not** block the air intake or air discharge vents.
- **Do not** drop, throw or abuse the freezer.
- **Do not** operate under extreme environmental conditions, such as in a car trunk, in very high humidity environments, in rain or other severe weather.
- **Do not** use solvents to clean the panel or the outside or inside of the freezer.
- An ultra low temperature freezer is qualitatively different than a home freezer. At -80º C frostbite can occur in seconds.
- The user should establish and follow a protocol for safe ULT operating procedures. This should include (but not limited to):
  — **Never** handle samples or freezer accessories with bare hands.
  — **Do not** use gloves which become brittle at ultra low temperatures.
  — Nitrile and latex gloves are inadequate.
- Liquid permeable gloves are dangerous because ULT liquids can contact skin and cause damage.
  — Be especially careful that liquids at ULT are not spilled onto skin or clothing.
  — Use only sample containers that have been approved or tested for ULT use.
  — Some plastics shatter at ultra low temperatures. Avoid splinter hazards.
  — Biological and chemical hazards are still hazardous at ULT. Always wear proper protective equipment and follow appropriate isolation protocols.
  — Many types of labels will fall off and/or break at ULT. Some types of ink which stick to glass and/or plastic at room temperature lose adhesion at ULT.
- In addition to the ULT hazards above, there are also physical hazards to consider:
  — Be cautious when closing the lid to avoid a pinching hazard.
  — Be careful when loading the box with heavy items.
  — **Always** use the handles to carry the freezer.

Unpacking and Set-Up

1. Remove the freezer and all accessories from the box.
Carefully inspect the freezer and all accessories for any shipping damage.

2. Check the packing list to verify that the shipment is complete.

3. Place the freezer on a level surface.

4. Make sure that the air inlets and outlets are not blocked.

5. Connect to a power source. The freezer can be used with either the AC Power Supply for lab, home or office use, or the DC Power Cord for automotive use.

A. To use the AC Power Supply:

i. Plug the AC power supply into the freezer.
ii. Plug the power supply into the mains/wall socket.
iii. The freezer will return to whatever state it was in (on or off) when it lost power.

B. To use the DC Power Cord in a motor vehicle:

i. Make sure the freezer remains level. Exceeding an angle of 12 degrees may cause loss of cooling.
ii. Plug the DC Power Cord into a 12V outlet that is rated at 15 amps or greater. (**NOTE**: Not for use with 24 volt automotive systems)
Consult your automotive specialist if your vehicle lacks 15 A rated 12V outlets.
iii. Plug the opposite end into the ULT-25.

6. Notes on operation in a vehicle.

A. The ULT-25 will operate on battery power for a limited time before the battery is drained and the vehicle cannot be started. This time will vary from vehicle to vehicle but is generally only a few hours.

B. The engine should be running to prevent accidental total discharge of the battery.

C. The power to 12V outlets in some vehicles may be interrupted during engine starting. This will cause a sudden stop of the cooling unit which may produce a sound that is different than when turning off the ULT-25 by using the Off button. This is normal and will not damage the cooling unit. The cooling unit will restart automatically once power resumes.

D. Do not operate the ULT-25 in an unattended vehicle. This may lead to overheating if left in the sun and subsequent damage to stored contents.

7. Disconnecting from power.

A. Turn off the freezer (see page 9)

i. The seven-segment display will show the word "OFF" while the FPSC turns off.
ii. Unplug the freezer after the word "OFF" disappears and the display goes dark.
iii. If you unplug the freezer while it is on, you will hear a sudden noise when the FPSC shuts off. Power outages will also cause the same noise. This noise (sort of a "bonk") is not indicative of damage.

FEATURES

Freezer

The Global Cooling ULT-25 FPSC freezer has the following features:

1. A freezer chamber which is protected by two lids
— Inner lid has a tight fitting foam lid
— Outer lid has a latching lid with a lock

2. Control Panel
— Described in more detail on page 7

3. Locking latch
— Can be locked to provide sample security

4. Access port
— For thermocouple wires, purge gas, etc.

5. Cleanable filter
— Helps protect the heat rejection fins from dust

6. Power Connector
— Polarized to avoid error

7. Vent

1

Outer Lid: double gasket moisture seal.

Inner Lid: high-density, closed cell, rigid foam.

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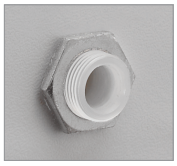


Access Port: 1/4" (6.3mm) standard– may be enlarged up to 1" (25.4mm).

5

Slide-out Filter: easy to clean, protects heat rejection fins.

6

Power Connection: polarized to avoid error.

Control Panel

A. Seven-Segment display
— Shows all numerical displays; default display is chamber temperature.

B. On/Off button and LED
— Turns freezer on and off and shows state.

C. Set T button and Set T LED
— This must be pressed to adjust the Set Temperature.

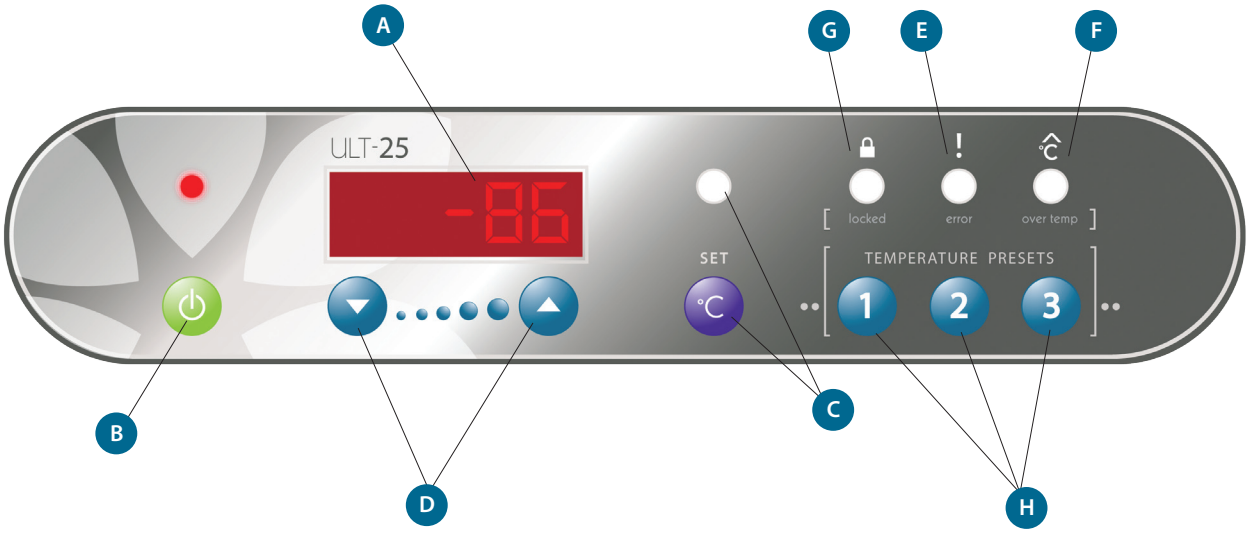
D. ▲ / ▼ buttons
— Used to adjust Set Point Temperature (when the display shows S ##)

E. Error LED
— Indicates when there is an electrical, mechanical or similar error condition.

F. Over T LED
— Indicates when the chamber is over/under the set point.
The audible beeper can be set to delay warning.

G. Locked LED
— Indicates when the panel is locked.

H. Temperature Preset buttons

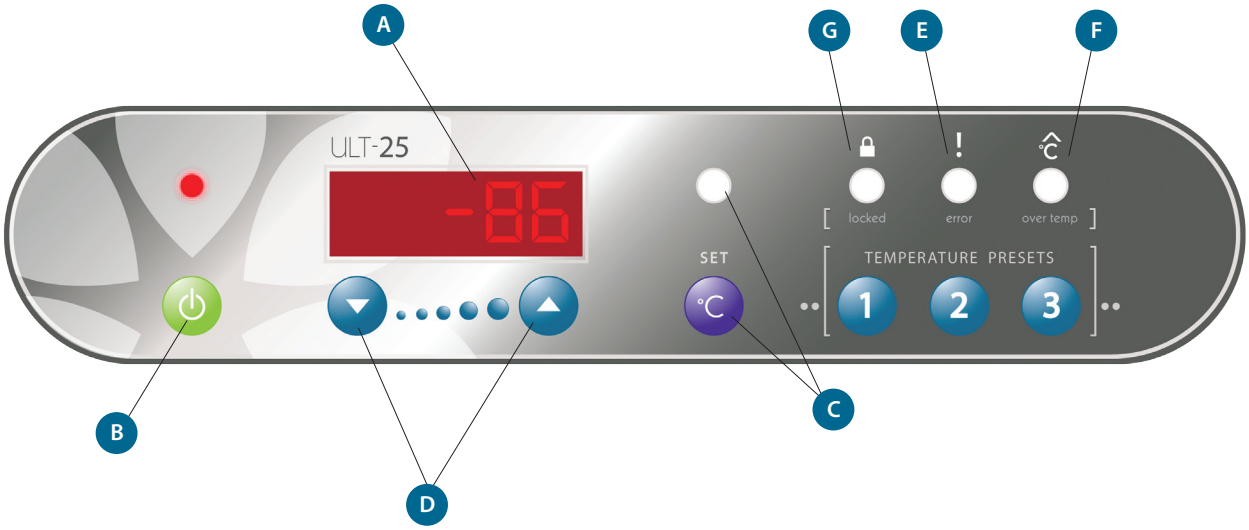


Quick Guide

clip, laminate, keep with freezer

BASIC FUNCTIONS		
Seven-segment display	A	Numerical display – chamber temperature, S ## – set point
ON	B	Press and hold I/O for two beeps
OFF	B	Press and hold I/O for three beeps
See Set Point	C	Press Set T briefly, S ## displayed
Return to Temp Display	C	Press Set T briefly, or wait eight seconds
Change Set Point	D	Press and hold Set T until Set T LED glows, S ## displayed, then ▲ or ▼

ADVANCED FUNCTIONS	
Change to Preset	Press and hold Set until Set T LED glows, S ## displayed, then Preset 1, 2 or 3
Postpone Over T Alarm	When Over T light glows, press Preset 3 until time shows (1.0 h) (If Over T LED is not glowing, then Preset 3 acts as a Temp Preset)
Return to Temp Display	Wait eight seconds
See Error Code Again	If Error LED is glowing then Press Preset 2 briefly (If Error LED is not glowing, then Preset 2 acts as a Temp Preset)
Lock Panel	Press and hold Preset 1 AND 2 AND 3 until Locked LED turns on (five seconds)
Unlock Panel	Press and hold Preset 1 AND 2 AND 3 until Locked LED turns off (five seconds)
Seven-segment display	P ## – Preset Temp, ## h – alarm silence, E ## – Error code



General Operating Principles

Important changes to the freezer settings require sustained button pushes. This helps prevent accidental changes to the settings during transportation. Some sequences require a three-second button press and hold while other sequences require a five-second button press and hold.

For example,
Turning the freezer ON requires a three-second press and hold (two beeps).
Turning the freezer OFF requires a five-second press and hold (three beeps).

The default display is the chamber temperature. Other displays such as Set Point, Alarm Postpone, etc., are marked with a letter such as S (Set Point), h (Alarm Postpone), etc. These secondary displays revert to the default display after approximately eight seconds of button inactivity.

How to Turn the Freezer On/Off

To turn the freezer on

- Press and hold the I/O button for two beeps (~three seconds)
- The freezer will display a greeting message, and then display the chamber temperature

To turn the freezer off

- Press and hold the I/O button for three beeps (~five seconds)
- The freezer will display "OFF" for 10 seconds, and then go dark

Changing the Set Temperature

To see the current set temperature

- Press the Set T button briefly
- The current set temperature will be displayed with the letter S ##
  — After eight seconds of inactivity the display will revert to the current temperature

Change the Set Point to a new value

- There two ways to change the Set Point
  — Manually adjusting the temperature using ▲ / ▼
  — Using one of three adjustable Preset Buttons
- Adjusting the Set Point manually
  — Because of the importance of the Set Point Temperature, changing the Set Point requires a "two-button procedure". This means:

  Method A - either holding the Set T button while simultaneously pressing ▲ / ▼ — OR
  Method B - holding down Set T until the Set T LED glows and then pressing ▲ / ▼
  (Methods A and B achieve the same effect. The user can use whichever method they prefer.)
- To change the set Set Point by **Method A**
  — Press and hold the Set T button and then push the ▲ / ▼ buttons (do not release the Set T button).
  - The Set Point temperature will appear with the prefix S in the seven-segment display.
  - When the ▲ / ▼ buttons are first pushed the Set Point will change by 1° C at first.
  - If the ▲ / ▼ buttons are held for five seconds the step size will increase/decrease by 5° C.
  - If the ▲ / ▼ buttons are briefly released (less than a half second) while continuing to hold down the Set T button the increment/decrement size will return to 1° C.
  - Release all buttons once the desired Set Point is achieved. The display will return to chamber temperature after about eight seconds.

- To change the Set Point by **Method B**
  — Press and hold the Set T button until the Set T LED glows.
    – The Set Point temperature will appear with the letter S in the first seven-segment display.
  — The ▲ / ▼ buttons can be used to change the Set Point.
    – When the ▲ / ▼ buttons are first pushed the Set Point will change by 1° C. at first.
    – If the ▲ / ▼ buttons are held for five seconds the step size will increase to 5° C.
    – Briefly release (a half second) the ▲ / ▼ buttons while continuing to hold down the SET button the increment/decrement size will return to 1° C.
    – Release the ▲ / ▼ buttons once the desired Set Point is achieved.
  — Press the Set T button briefly (less than one second) to turn off the Set T LED. The display will return to chamber temperature.

Using Preset Temperatures

- The three buttons labeled 1, 2 and 3 can be used to quickly change the Set Point to frequently used values. When shipped the Presets are set to -80° C, -40° C, and -20° C. They can be set to any preferred values.
- To choose one of the preset temperatures:
  — Press and hold the Set T button until the Set T LED glows
  — Push one of the Preset Temperature buttons briefly
  — The new set temperature will be shown in the seven-segment display
  — If this is the desired Set Temperature the user can either:
    – Briefly press the Set T button to turn off the Set T LED — OR
    – Wait for approximately eight seconds when the freezer panel will return to normal operation

Over-Temperature Alarm

- If the freezer compartment temperature is 10° C warmer or colder (adjustable, see below) than the set point for five seconds then it will go into temperature alarm mode.
  — The Over T light will go on (this is used for under temperature alarms as well).
  — The freezer will make a double beep every 10 seconds.
  — Situations which can affect the freezer's ability to maintain a steady state or cooling rate include:
    – The lid is ajar
    – The air vents are blocked
    – Addition of a large relatively warm mass
    – Power supply problems
    – Mechanical and/or electrical problems

How to silence the audible temperature alarm

- The Over T light will always be lit when the cooler temperature is over or under the set temperature by more than 10° C.

To postpone an alarm

- When the audible alarm is sounding it can be postponed
- Press the button beneath the Over T LED and the audible alarm will be turned off for 1.0h
- Typical times for recovery to -80° C after adding RT samples to -80° C chamber

— (16) 15-ml centrifuge tubes	w/ centrifugate	0.8 h
— (96) 2-ml cryovials	w/1.8 ml cryopreservant	1.5 h
— (8) 50-ml centrifuge tubes	filled w/water	3.5 h
— (2) 500-ml bottles	filled w/water	8.0 h

Error Conditions

- Certain conditions will cause an Error Code to be displayed on the seven-segment display, and the Error LED will be lit.
  - The error code will be of the form E ##, where ## is the error code.
  - The error code will be displayed for about five seconds and then the display will show the chamber temperature. The Error LED will stay on.
  - The error code can be recalled by briefly pressing the button under the Error LED. This will recall the error code for approximately 10 seconds.
  - If button 2 is pressed and held for five seconds (three beeps) this will clear both the seven-segment display and the Error LED. However, if the error condition persists the error cycle will start over again.

Locking the Panel

To lock the freezer panel

- Press and hold buttons 1, 2 and 3 until the freezer beeps three times
  - The Locked indicator LED will light up
  - The user cannot lock the panel if there is an over temperature or error condition

To Unlock the freezer panel

- Press and hold buttons 1, 2 and 3 until the freezer beeps three times
  - The Locked indicator LED will then turn off
  - The freezer will still indicate over-temperature alarms or error conditions while it is locked. The user has to unlock the panel to handle those alarms/conditions.

How to Switch Between Power Supplies

- There are several possible power sources for the ULT-25.
  - GC provided Mean Well 15V power supply
  - Automobile accessory plug (cigarette lighter)
- When changing from one power supply to another the user should first stop the ULT-25.
  - Turn OFF the ULT-25 (Press and hold the I/O button).
  - Wait for the FPSC to slow and stop (15 seconds).
  - Unplug the ULT-25 from one power source and plug it into the next.
  - The ULT-25 can be restarted immediately, no wait time necessary.
  - Turn ON the ULT-25 by pressing and holding the I/O button.

Error Codes

These are displayed in the seven-segment display as E ##

10	The FPSC is not maintaining a working temperature on the heat rejection fins. This could arise from blocked filters, blocked air passages, unusually hot ambient temperatures (for example >45º C), or a fan failure. Check air passages and clear any blockages for good air circulation. Remove from hot environments (car interiors, etc.).
40	A component which monitors FPSC performance has failed. The FPSC cannot regulate itself. Please return for repair.

Maintenance

With the exception of the filter, there are no user serviceable parts to maintain.

Air Intake Filter

Clean accumulated dust and dirt on the air intake filter every month. Pull the filter cover to the left as shown. Please note that it cannot be completely removed. Gently clean the filter with a vacuum cleaner. If there are stubborn residues use a soft brush to work them loose.

Storage

1. Turn off the power and allow the freezer to come to room temperature.
2. Dry the inside of the freezer compartment and clean any spills.
3. Disinfect with suitable sterilizing agent if the freezer has been used for biohazards.

Cleaning

The exterior surfaces of the ULT-25 can be cleaned as needed by using a soft cloth and mild detergent. Do not use solvent or harsh abrasive cleansers or pads.

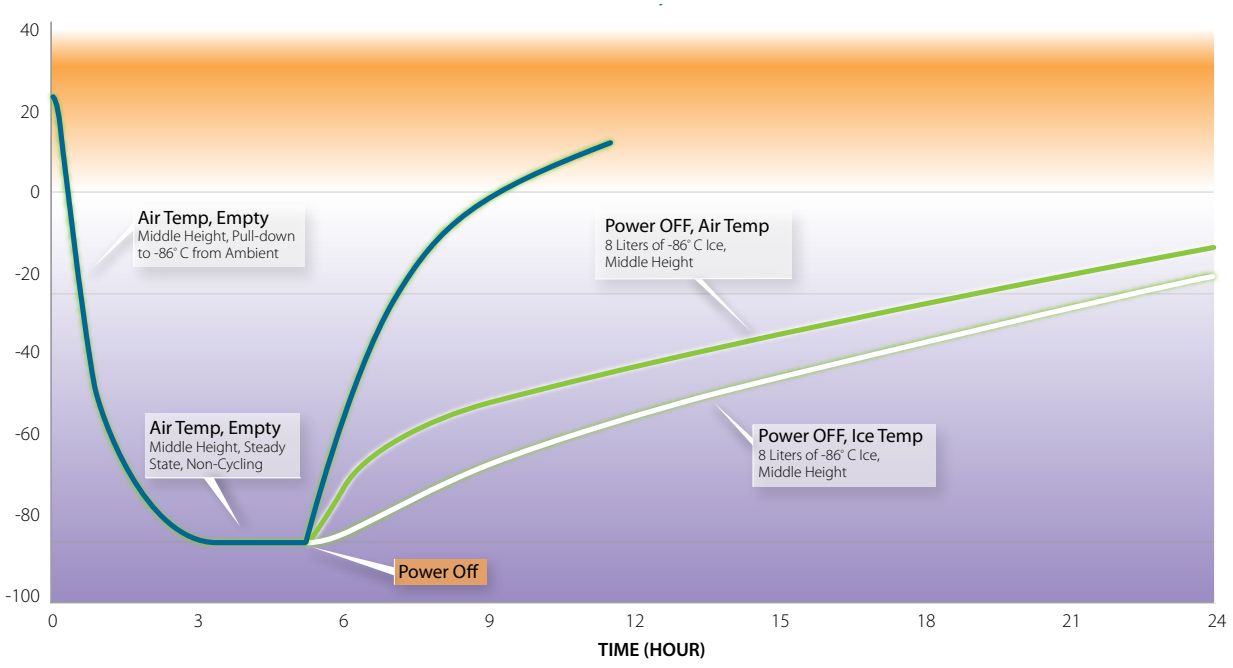
Troubleshooting

Problem	Possible Cause	Solution
Freezer does not power on	Power is not getting to the freezer from the Power Supply	Check the connections to the power supply
		Assure that the wall plug is firmly seated
	Power is not getting to the freezer from the Auto Accessory Plug	Reseat the connections to the accessory plug
		Remove any dirt or burnt material inside the accessory socket or on the plug
		Replace any blown automobile fuses
Freezer does not achieve desired temperature	Inadequate air circulation	Clean air filter screen
		Remove air flow obstructions
	Inadequate power	Assure that the wall plug is firmly seated
		Remove any dirt or burnt material inside the automotive accessory socket or on the plug
		Operate freezer only when automobile is running
	Improper environment	Remove freezer from direct sunlight, hot room, etc.
		Check that freezer is level. Tilts of more than 12 degrees in some directions will degrade performance.
Freezer cools slowly	Overloading of freezer	Remove some items from freezer
	Lid is not completely closed	Check for ice buildup, remove if necessary, and properly close lid
	Lid is open and closed too often	Minimize opening and closing of lid
	Inadequate air circulation	Clean filter and unblock air vents
12V plug becomes unusually hot	Dirt or corrosion in the accessory socket	Clean the socket

Specifications

Operating Voltage	DC 15 V (11 – 16 V)
Power Consumption	~150 W
Set Temperature Range	-86º C to -20º C
Ambient Operating Temperature	0º C to +35º C
Volume	9.0 cu.ft. | (25 liters)
Interior Dimensions	13.0" L x 8.7" W x 13.0" D | (330.2 x 222.2 x 330.2mm)
Exterior Dimensions	27.1" L x 13.6" W x 18.3" H | (688.1 x 346.5 x 464.3mm)
Net Weight, Empty	40 lbs. (19 kg)

Pull-Down and Warm-Up Characteristics, 25ºC Ambient



Warranty

GLOBAL COOLING INC., as the Manufacturer warrants the quality of all parts used in the construction of the ULT-25 to be free from defects to the original purchaser.

1. This WARRANTY shall continue for one year from the original delivery date, i.e., one year from the time of delivery to the shipper (e.g., UPS, FedEx, etc.).
2. This WARRANTY shall have force and effect only if all items are operated in accordance with instructions provided by the Manufacturer.
3. This WARRANTY shall not extend to ordinary wear and tear.
4. This WARRANTY shall not extend in any way to liability (whether or not construed on tort or contract or any other theory of law) to consequential damages resulting from:
   - Ordinary use of the product
   - Abuse or misuse of the product
   - Interruption or cessation of the operation of the product from any cause whatsoever, including but not limited to power failure, low voltage, acts of God, explosion, negligent operation and the like.
5. This WARRANTY shall extend only to furnishing for replacement a part found by the Manufacturer to be defective.
6. This WARRANTY shall not extend nor cover any part used as a replacement part beyond the original one year product WARRANTY: nor does the Manufacturer undertake any obligation in connection with this WARRANTY other than that specifically set forth above. No person is authorized to make any representation as to this WARRANTY except duly authorized officers of Global Cooling Inc.
7. Global Cooling Inc. agrees if instructions as to operation and use are strictly followed, and power sources (circuits, voltages, etc.) are properly applied, to provide within one year after original delivery to the shipper, labor free of charge to maintain the product in good working condition.
8. The customer will pay for the cost of returning the freezer to Global Cooling Inc. (or to the distributor if approved by Global Cooling Inc). Global Cooling Inc. will pay for the cost of returning the freezer to the customer, unless examination of the freezer demonstrates that the freezer was damaged by operation or handling outside the instructions provided by the Manufacturer.
9. This WARRANTY is limited to products purchased and used in the United States of America.

"Consequential damages" shall be defined to include, but not limited to spoilage of, or damage to contents placed in the product, loss of profits, expenses of delay resulting from interruption or cessation of the operation of the product, loss of customers or business good will, any time element loss, or any other special damages.

ALL WARRANTY returns MUST be decontaminated according to current laboratory protocols appropriate for any biohazards which were contained in the freezer. A list of all biohazard agents which had been contained in the freezer and a copy of the decontamination protocol used must accompany every freezer returned for repair.

Global Cooling Inc. reserves the right to change all specifications for the mechanical, physical or firmware portions of this product without notice.

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